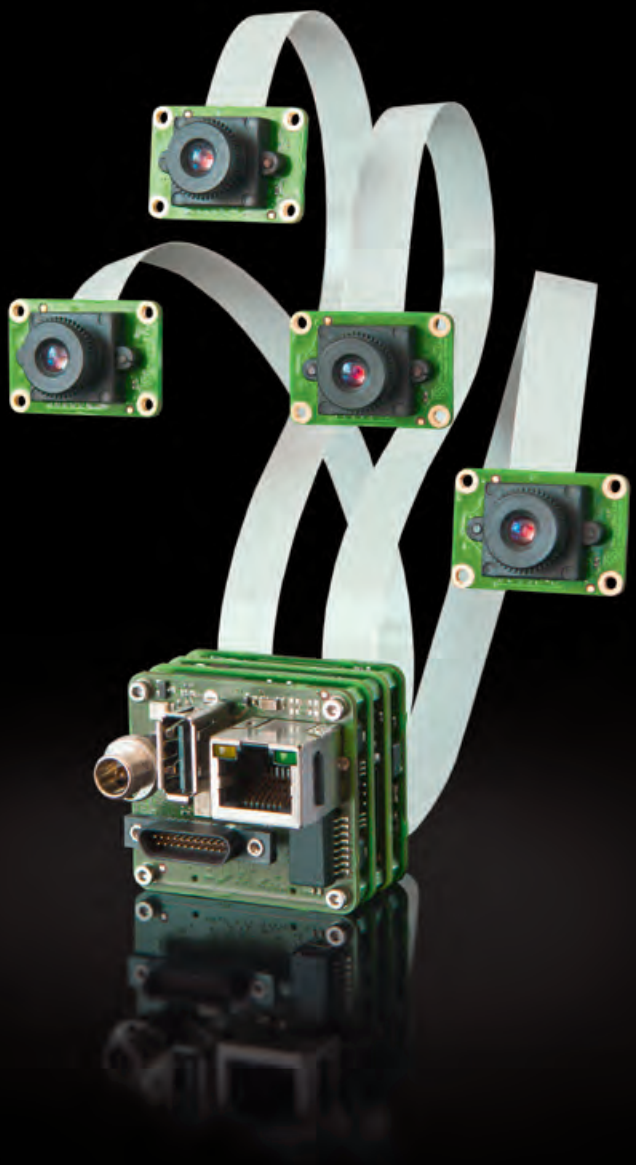
VRmagic Imaging Solutions

Cameras | Framegrabbers | 3D Sensors | Made in Germany

VRmagic

Freely Programmable Intelligent Cameras



All intelligent cameras from VRmagic are equipped with a dual-core processor featuring an ARM and a DSP core, offering high processing power at all times. Running a Debian Linux operating system, the freely programmable cameras can be used just as an embedded PC. Developers can transfer applications to the camera, and image processing tasks – such as decisions on position, completeness or quality – are performed fully autonomously in the camera.

Sensor Features

- Global shutter, interline transfer, or rolling shutter
- CMOS or CCD sensors
- Resolutions from VGA to 4.2 Megapixels
- Monochrome or color with Bayer RGB matrix

Embedded System

Two different embedded systems are available. The new D3 high-performance platform with a 1 GHz ARM Cortex-A8, a 700 MHz C674x DSP and a whole set of new features like the Gigabit Ethernet interface. The second system is the well-known D2 platform with a 300 MHz ARM9 and a 600 MHz C64x DSP.

Available Designs

Multi-sensor camera: up to four freely positionable sensor boards are connected to the camera base unit by flex-foil cable. Available as board-level camera.

Single-sensor camera with remote sensor: an external sensor board is connected to the camera base unit by flex-foil cable. Available as board-level camera.

Single-sensor camera: with on-board sensor, available as board-level camera or as housing camera.

Custom-built form factor: camera solutions designed to perfectly suit your application.

Comparison of the D2 and D3 Intelligent Camera Platform

New D3!

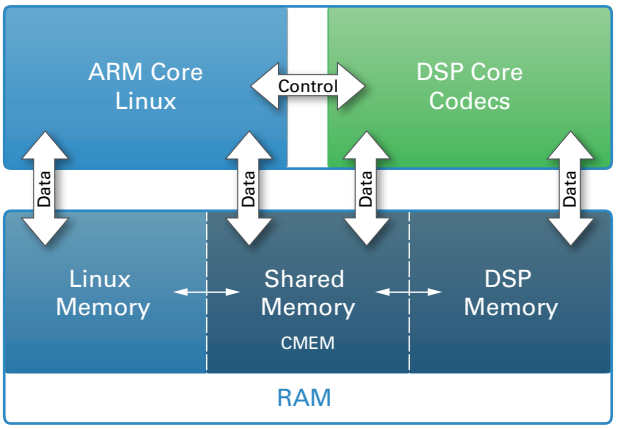
Hardware Features	D2	D3
Operating System	Linux (Debian)	Linux (Debian)
ARM Core and Frequency	300 MHz ARM9	1GHz ARM Cortex-A8
DSP Core and Frequency	600 MHz C64x	700 MHz C674x
ARM and DSP Instruction Type	fixed point	both fixed point and floating point
RAM	256 MB DDR2-333	2 GB DDR3-800
Memory Bus Width / Bandwidth	32 Bit / 1332 MB/s	2 x 32 Bit / 8258 MB/s
Flash Memory	512 MB	16 GB
SD Card	no	yes
Ethernet	100 Mbit/s	1 Gbit/s
USB Host / Device	yes / no	yes / yes
GPIOs	up to 13	up to 44
RS232 / RS485	yes / optional	yes / yes
SATA	no	yes
CAN Bus	optional	yes
JTAG	yes	yes
Real-time Clock (RTC)	optional	yes
Maximum Video Resolution	720p	1080p
S-Video	yes	yes
RGB888	yes	yes
HDMI	optional	yes
Audio in/out	optional	yes
Wake on LAN	no	yes

Software Features	D2	D3
HALCON Embedded	no	yes
OpenCV	no	yes
VM_Lib	yes	yes
Mono compatible .NET interface	yes	yes

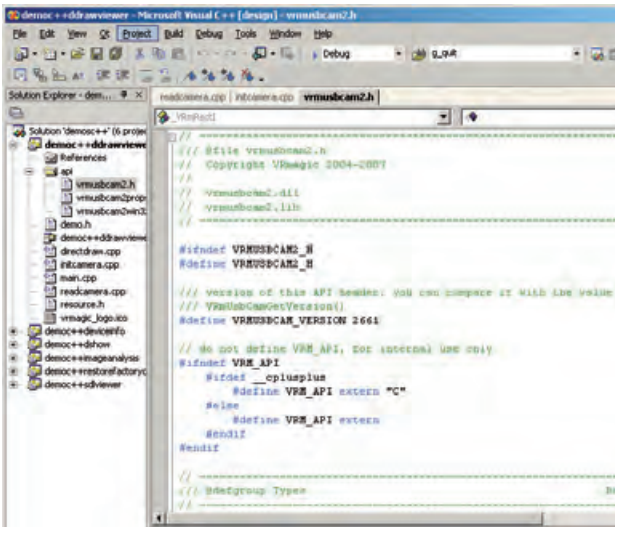
ARM/DSP Dual-Core Programming

Image Processing on the Dual-Core Chip

VRmagic intelligent components feature a highly integrated dual core chip with parallel processing architecture. The ARM processor runs the Linux operating system while the DSP is entirely available for image processing tasks. Communication between ARM and DSP is carried out through the Texas Instruments Codec Engine. TI offers various commercial codecs and open source algorithms for the DSP, for example the IMG Lib for basic image processing tasks. A free codec by VRmagic converts the image data into various target formats, for example RGB565, YUV, or RLE.



Architecture of the dual-core-chip; variable size of the memory areas



Development of algorithms in standard environments such as MS Visual Studio

Convenient Application Programming

With a standard Debian Linux operating system and full access to the ARM/DSP processor, intelligent cameras by VRmagic provide a convenient platform for programming own applications with C/C++ or other programming languages. Algorithms can be developed in standard environments such as MS Visual Studio or Code Composer Studio and then transferred to the camera.

D3 Platform

With the D3 platform, ARM applications can be transferred to the camera without cross-compiling thanks to the Mono compatible .NET interface.

D2 Platform

If using the D2 platform, code has to be cross-compiled for the ARM using the pre-configured toolchain for Windows and Linux included in the VRmagic SDK. Then the code can be transferred to the camera.

Extendable Linux Operating System

Additional components can be easily installed on the camera using the Linux package repository, for example web servers or NFS servers. USB devices such as Wi-Fi or Bluetooth dongles, hard drives, mice or keyboards can also be used with the camera.

Fast Compiling for DSP

Code for the DSP needs to be cross-compiled using the TI DSP compiler. The TI DSP compiler and required tools are available free of charge.

Easy Debugging

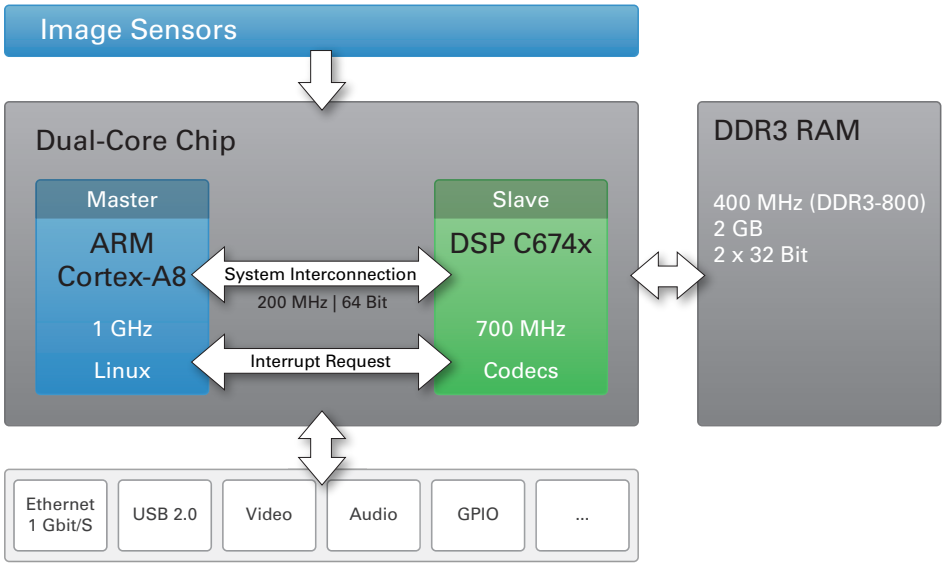
- ARM applications for the camera can be developed, tested, and debugged on a PC. Then, the software can be copied to the camera.
- Remote debugging of ARM applications possible via Ethernet, for example with Eclipse and gdbserver.
- TI TraceUtil enables printf-debugging of DSP code.
- JTAG port for connection of real-time emulators (XDS510 or XDS560) and DSP debugging with CCS.

Updates via Ethernet

Updates of your camera applications and of the camera firmware are possible via the Ethernet interface, which is very convenient especially if you cannot access the cameras directly in the field. Cameras with the D2 platform can also be updated using a USB flash drive.

Simple Data Transfer between Camera and Host

- Windows/Samba share
- NFS or FTP server/client
- USB flash drive
- SD card (D3 platform)



Intelligent camera architecture using the example of the new D3 platform

Software Development
for Intelligent Cameras

Software Development

The included software development kit (SDK) contains an application programming interface (API), which offers full control over the camera and works with all cameras and framegrabbers from VRmagic. This makes it possible to exchange camera models later on without additional programming costs. The graphical user interface allows full access to all camera parameters. Demo applications and free source codes for several developing platforms are included in every camera's scope of delivery.

NEW D3

HALCON Embedded

HALCON is a powerful machine vision toolkit with more than 1800 operators. With HALCON Embedded, this comprehensive imaging solution now runs directly on the D3 intelligent camera platform. This means that you can develop any HALCON HDevelop script on your PC and let it run directly on the camera's embedded system – it is as easy as it sounds.

Mono Compatible .NET Interface

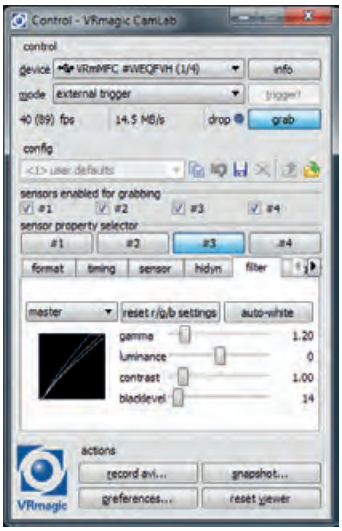
Thanks to the new Mono compatible .NET interface available on all intelligent camera platforms, development of applications now has become easier. Develop own applications on the PC and copy them to the intelligent camera without cross-compiling - that's it. Mono is an open source implementation of Microsoft's .NET Framework designed for cross-platform applications.

CamLab Application

The CamLab application is part of the VRmagic SDK. It offers user full control over all sensor parameters via a graphical user interface. Tool tips indicate the respective property for each parameter.

Free Demos with Sources

The following demos and sources are included in the SDK: Bayer/Grey to RGB565 converter on ARM or DSP, Demo for integration of customer specific DSP codecs (JPEG, Sobel, etc.), Viewer for S-Video output (DirectFB and SDL), Control of general purpose I/O's.



The VRmagic CamLab, which ist part of the SDK, offers full access to all camera parameters via its graphical user interface.

Programming Libraries

NEW D3

Open CV

OpenCV is an open source vision library with more than 2500 optimized algorithms ranging from tracking of eye movements to 3D point cloud calculation from stereo cameras. Open CV now runs on the new D3 intelligent camera platform by VRmagic, offering access to the full range of programming functions.

VM_LIB

The VM_LIB is a machine vision library included* in VRmagic´s SDK for use on intelligent cameras. The library is optimized for the camera API and contains various algorithms (C functions) for image processing tasks, such as object detection, pattern recognition, bar code scanner, blob segmentation, and many low-level functions. The VM_LIB is available for DSP, ARM, and PC platforms running Linux or Windows (x86).

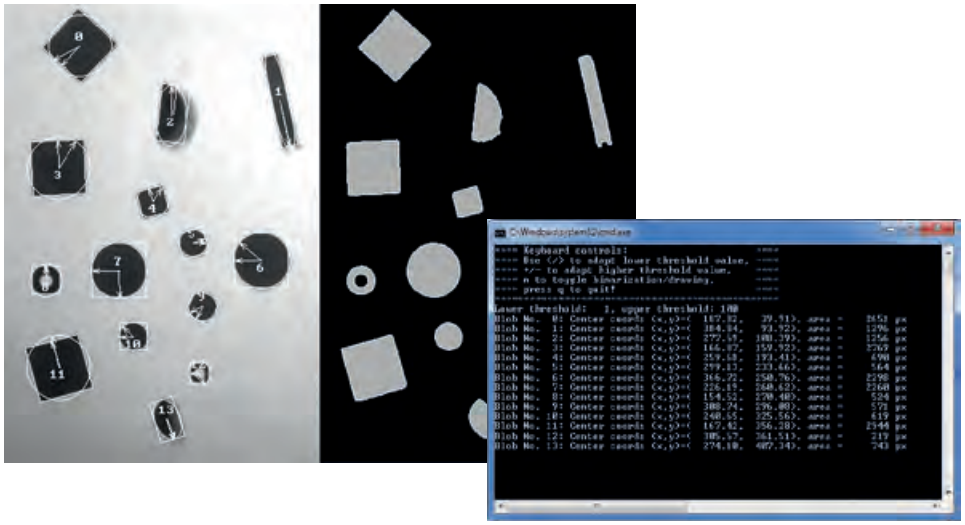
Codec for the VRmagic Camera API

VRmagic has developed a codec for ARM and DSP based on the TI Codec Engine, which is specifically optimized for the camera API. The codec can convert the image data of the sensor into different target formats such as RGB32, RGB24, RGB565, YUV, GRAY, or RLE. Available for all intelligent cameras.

VRmagic GStreamer Plugin

GStreamer is a multi-platform, open-source library that provides a wide range of codecs and filters for multimedia applications. The VRmagic SDK comprises a GStreamer plugin with an interface to the camera API for image grabbing, camera control, color conversion on the DSP, and integration of custom codecs. In addition, there is a GStreamer plugin from Texas Instruments offering easy integration of various DSP codecs (H.264, MPEG-4, JPEG) into the processing pipeline. GStreamer supports various IP streaming protocols (TCP, UDP, RTP, RTSP).

Blob segmentation, one of the machine vision algorithms included in the VM_LIB »



*The VM_LIB is free of charge for non-commercial purposes and for development of applications with VRmagic components. If an application shall be distributed as (part of) a product, license agreements are required.

Intelligent Cameras

With Up To 4 External Sensors

Multi-Sensor Camera

Intelligent multi-sensor cameras are equipped with 2, 3, or 4 pixel-synchronous sensors. The sensor boards are connected to the camera base unit with up to 100 cm long flex-foil cables and can be positioned freely. The powerful dual-core CPU and an FPGA chip with 256 MB RAM provide for pixel-synchronous, smooth processing of image data.

Different camera base units and sensor types are available and can be combined. Sensors can be added or removed easily through the camera's plug and play functionality. Color and monochrome variants of the same sensor type can be used simultaneously on the same base unit.

Intelligent multi-sensor cameras consist of one base unit VRmDMFC and 2, 3, or 4 remote sensor boards VRm(M)S-X.

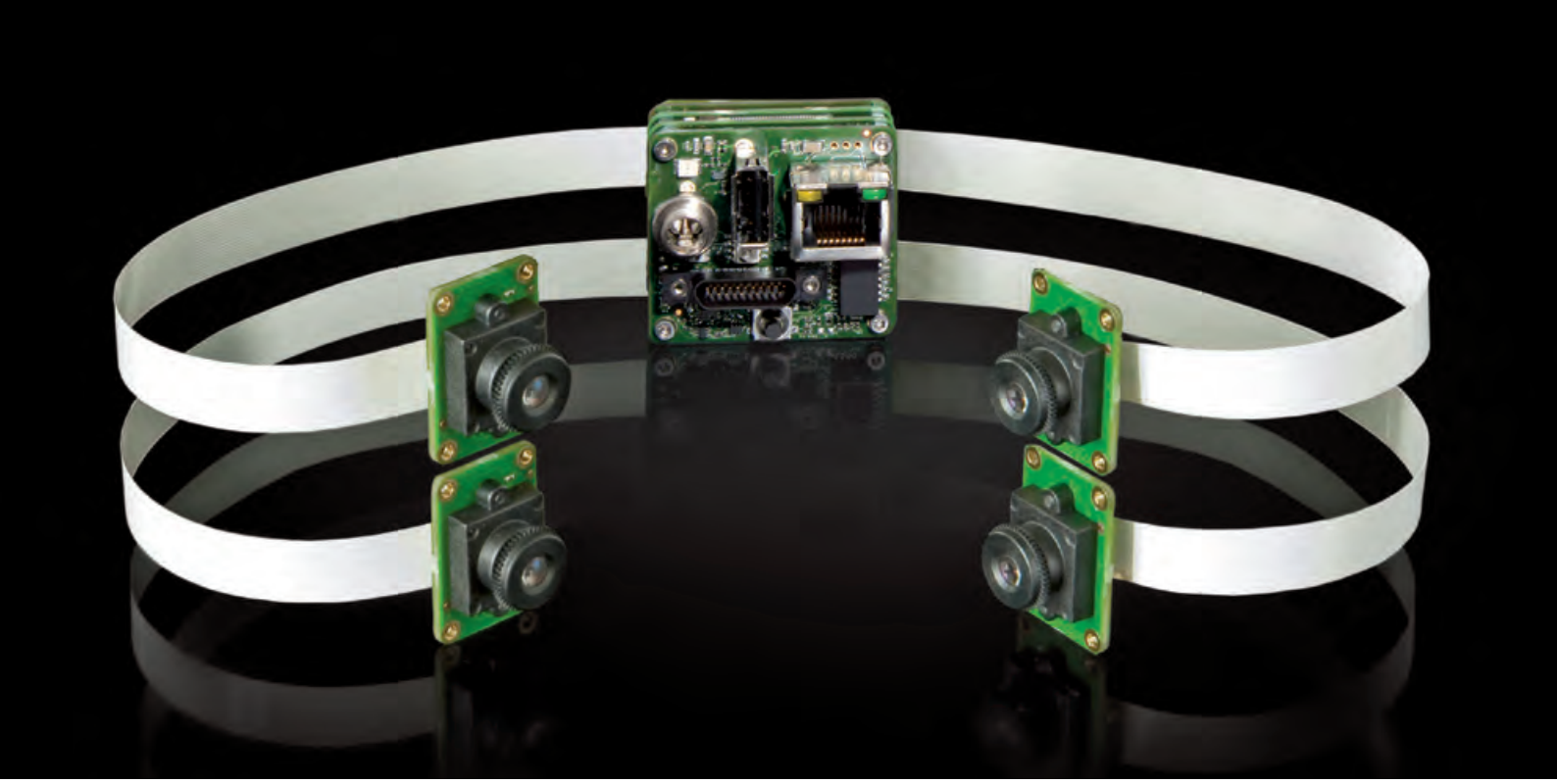
Single-Sensor Camera with Remote Sensor

For applications with tight or angled installation space VRmagic offers single-sensor cameras with a freely positionable external sensor board. The sensor board is connected to the camera base unit with an up to 100 cm long flex-foil cable with LVDS transmission.

Intelligent single-sensor cameras with remote sensor consist of one base unit VRmDC-X-E and one remote sensor board VRm(M)S-X.

Sensor Board Designs

- **OEM**: board-level camera without optics
- **COB**: board-level camera with lens mount (M9 low profile, M12, or C-Mount), filter glass, and lens



Sensor Characteristics

Sensor Board	VRmS-8 *	VRmS-9	VRmS-12	VRmMS-12	VRmS-14
Sensor Manufacturer	Aptina	Aptina	Aptina	Aptina	Sony
Type	MT9T031	MT9M001	MT9V024	MT9V024	ICX445
Technology	CMOS	CMOS	CMOS	CMOS	CCD
Shutter	rolling	rolling	global	global	Interline Transfer
Color	●		●	●	●
Monochrome		●	●	●	●
Sensor Size	1/2“	1/2“	1/3“ wide	1/3“ wide	1/3“
Resolution	2056 x 1544	1288 x 1032	754 x 480	754 x 480	1296 x 966
Pixel Size [µm]	3.2 x 3.2	5.2 x 5.2	6 x 6	6 x 6	3.75 x 3.75
FPS (Full ROI)	13	30	69	69	22
Min. Exposure Time [µs]	60	38	30	30	15

Physical Characteristics

	VRmS-8 *	VRmS-9	VRmS-12	VRmMS-12	VRmS-14
Base Unit Size [mm]					
Multi-Sensor	–	42 x 38 x 41 (28)			
Remote Sensor	42 x 38 x 34 (21)	42 x 38 x 34 (21)			
Sensor Board Size [mm]					
OEM	42 x 38 x 7	42 x 38 x 7	42 x 38 x 7	28 x 19 x 7	42 x 38 x 9
Sensor Board Size [mm]					
COB M9LP	–	–	–	28 x 19 x 11	–
COB M12	42 x 38 x 20	42 x 38 x 20	42 x 38 x 20	28 x 19 x 17	42 x 38 x 20
COB C-Mount	46 x 42 x 24	46 x 42 x 24	46 x 42 x 24	–	46 x 42 x 24
Interfaces in combination with D2 CPU board	100 Mbit Ethernet on RJ45 (supports streaming over Ethernet using TCP/IP), USB 2.0 host, MPE-Garry Micro-T connector for trigger/strobe/RS232/S-Video/GPIOs, Hirose DF14-15P connector for JTAG and serial console, 5 V power supply				
Optional Interfaces	DVI or HDMI output available on separate adapter board (in combination with Pico interface board)				
Sensor also available with D3 platform	●	●	●	●	●

New D3!

All dimensions W x H x D without lens and including connectors. Dimensions in brackets refer to the depth of cameras with Pico interface board.
* The VRmS-8 sensor board can only be used with a remote sensor camera. Usage with multi-sensor cameras is not possible.

Intelligent Single-Sensor Cameras

Single-sensor cameras are available with a wide range of different sensors, designs, and features. This ensures that you will always find a camera that perfectly matches your image processing requirements.

- **OEM**: board-level camera
- **COB**: board-level camera with lens mount (M12 or C-Mount), filter glass, and lens
- **PRO**: anodized aluminium housing camera with lens mount (C-Mount) and filter glass

Ultra-Precise Sensor Positioning

All cameras in COB C-Mount or PRO design that are equipped with a Sony or a CMOSIS sensor are assembled using the ultra-precise sensor positioning system developed by VRmagic. The sensor is positioned and aligned with the highest possible accuracy before it is soldered to the board.

Pico Interface Board

For applications requiring a more compact design, the standard interface board can be exchanged with the pico interface board featuring miniature connectors for all interfaces. The pico interface board reduces weight, allows inexpensive connectors, and decreases board height by 13 mm.

Optional Digital Video Output Interfaces

An additional RGB888 interface on the pico interface board allows connecting an external HDMI or DVI output board to the camera using a flexible printed circuit cable. The camera sensors can be synchronized to the RGB888 video output.

From left to right: OEM board-level camera with standard interface board, PRO housing cameras, OEM board-level camera with Pico interface board and external HDMI/DVI output board

From left to right: PRO housing camera, COB M12 board-level camera, OEM board-level camera

Sensor Characteristics

	VRmDC-8	VRmDC-9	VRmDC-12	VRmDC-14	VRmDC-16	VRmDFC-22	VRmDFC-42
Sensor Manufacturer	Aptina	Aptina	Aptina	Sony	Aptina	CMOSIS	CMOSIS
Type	MT9T031	MT9M001	MT9V024	ICX445	MT9M021	CMV2000	CMV4000
Technology	CMOS	CMOS	CMOS	CCD	CMOS	CMOS	CMOS
Shutter	rolling	rolling	global	interl. transfer	global	global	global
Ultra-precise Sensor Positioning	–	–	–	● PRO, COB C-Mount	–	● PRO, COB C-Mount	● PRO, COB C-Mount
Color	●	–	●	●	●	●	●
Monochrome	–	●	●	●	●	●	●
Sensor Size	1/2“	1/2“	1/3“ wide	1/3“	1/3“	2/3“ ultra wide	1“
Resolution	2056 x 1544	1288 x 1032	754 x 480	1296 x 966	1280 x 960	2048 x 1088	2048 x 2048
Pixel Size [µm]	3.2 x 3.2	5.2 x 5.2	6 x 6	3.75 x 3.75	3.75 x 3.75	5.5 x 5.5	5.5 x 5.5
FPS (Full ROI)	13	30	69	22	45	44	24
Min. Exposure Time [µs]	60	38	30	15	67	1,5	1,5

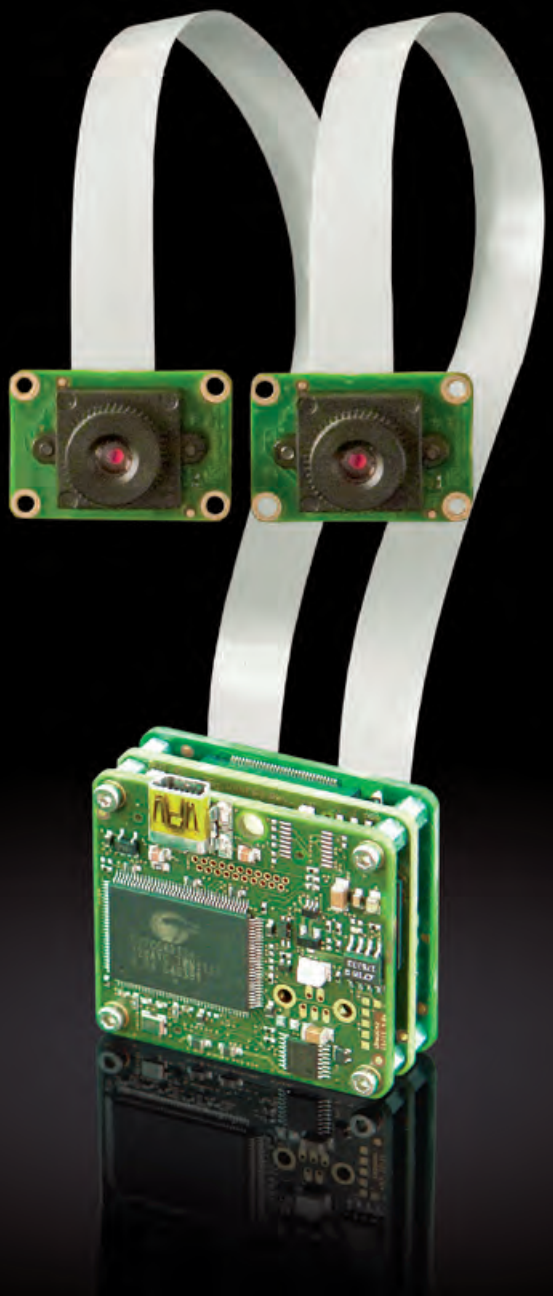
Physical Characteristics

	VRmDC-8	VRmDC-9	VRmDC-12	VRmDC-14	VRmDC-16	VRmDFC-22	VRmDFC-42
Size **OEM** [mm]	42 x 38 x 35 (22)			42x38x36 (23)	42x38x35 (22)	42 x 38 x 43 (30)	
Size [mm]							
COB M12	42 x 38 x 48 (35)			42x38x48 (35)	42x38x48 (35)	–	
COB C-Mount	46 x 42 x 52 (39)			46x42x52 (39)	46x42x52 (39)	46 x 42 x 59 (46)	
Size **PRO** [mm]	46 x 42 x 51			46 x 42 x 52	46 x 42 x 51	46 x 42 x 59	
Interfaces in combination with D2 CPU board	100 Mbit Ethernet on RJ45 (supports streaming over Ethernet using TCP/IP), USB 2.0 host, MPE-Garry Micro-T connector for trigger/strobe/RS232/S-Video/GPIOs, Hirose DF14-15P connector for JTAG and serial console, 5 V power supply						
Optional Interfaces	DVI or HDMI output available on separate adapter board (in combination with Pico interface board)						
Sensor also available with D3 platform	●	●	●	●	●	●	●

New D3!

All dimensions W x H x D without lens and including connectors. Dimensions in brackets refer to the depth of cameras with Pico interface board.

USB Cameras – Plug and Play!



USB cameras by VRmagic are perfectly suited to handle standard tasks efficiently and economically. The image data is transferred directly to the host system via the high-speed USB interface. This allows uncomplicated integration into existing applications.

USB Camera Highlights

- Power supply via USB – no separate power supply required for most cameras
- Direct connection to a PC or notebook
- Very small single-board camera models available (+OEM, +COB, +PRO)
- Cost-efficient image processing solution
- Easy plug and play operation

FPGA Chip for Pre-processing of Images

All USB multi-sensor cameras and all cameras with CMOSIS image sensor are equipped with an FPGA chip, which is able to preprocess image data directly in the camera. For example, images can be compressed to reduce the load of the host system.

Options

- Different CMOS and CCD sensors from Aptina, CMOSIS, and Sony
- Resolutions from VGA to 4.2 megapixels
- Color and monochrome sensors
- Global shutter, interline transfer, and rolling shutter
- Available in many different designs

« *OEM Multi-sensor camera with two sensor boards*

PRO single-sensor cameras in aluminium housing

Software Development Kit

The included software development kit (SDK) contains an application programming interface (API) that works with all cameras and framegrabbers from VRmagic. The lean API and the property interface allow development of code that works on every VRmagic camera. This makes it possible to exchange camera models later on without additional programming costs. The graphical user interface allows full access to all camera parameters. Demo applications and free source codes for several developing platforms are included in every camera's scope of delivery.

CamLab Application

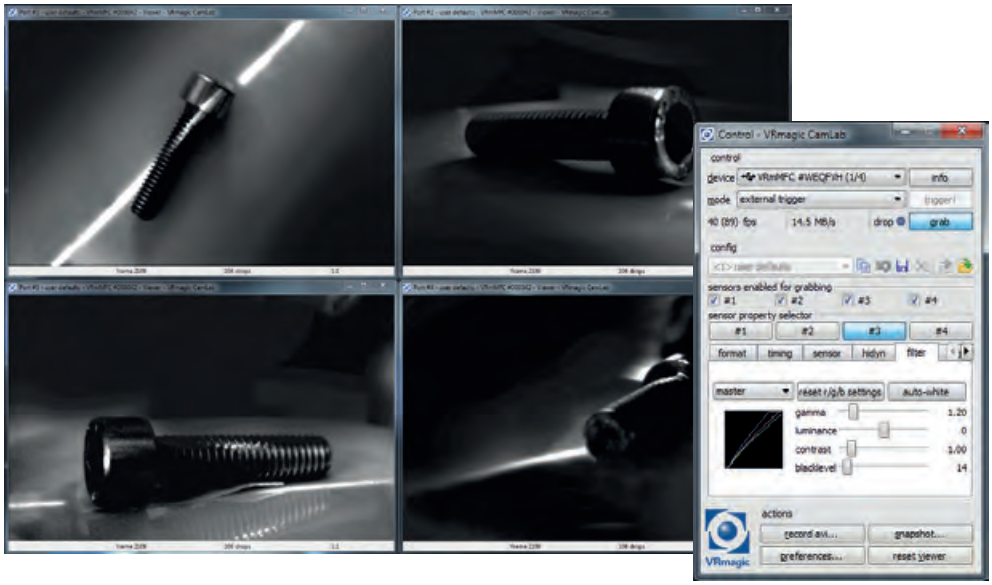
The CamLab application is part of the VRmagic SDK. It offers full control over all sensor parameters via a graphical user interface. Tool tips indicate the respective property for each parameter.

Multi-Viewer Support

The VRmagic CamLab application offers multi-viewer support for all multi-sensor cameras. The pixel-synchronous image data of up to four sensors can be displayed on the screen of a PC simultaneously. The API enables convenient access to the captures images.

Highlights of the SDK

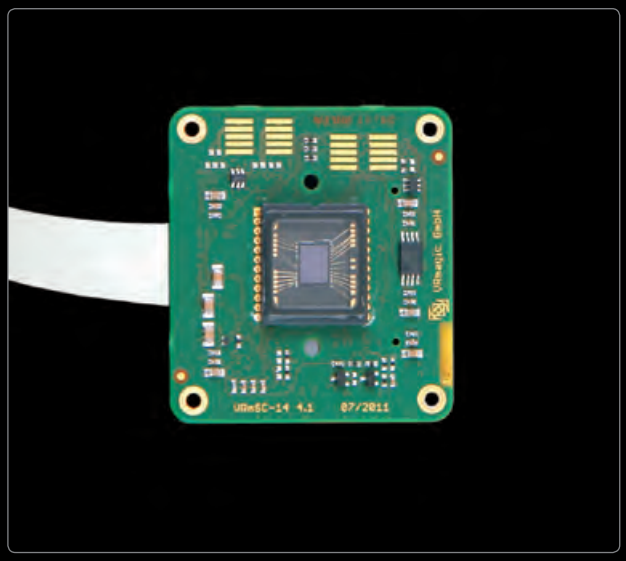
- Full control over all camera parameters
- Individual adjustment of exposure, gain, or white balance
- Optimized image conversion (1-pass) to RGB32, RGB24, RGB565, Gray, and YUV
- Optional horizontal or vertical image inversion
- Correction of gamma, brightness, and contrast via look-up tables.



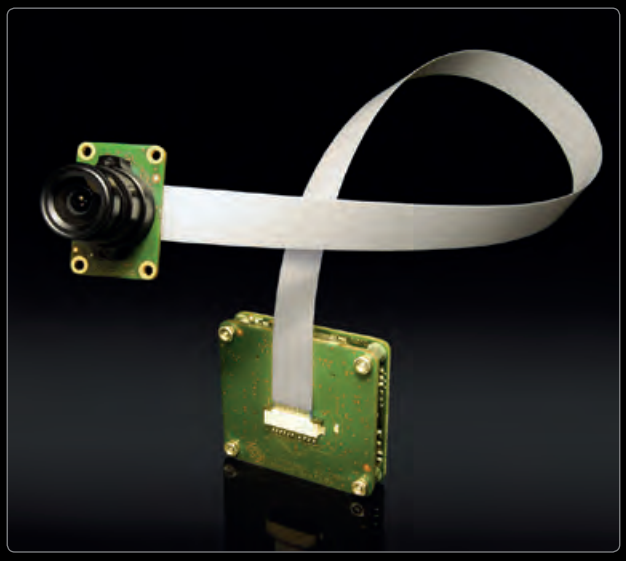
VRmagic CamLab offers full access to captured images and all camera parameters via its graphical user interface. The images of multi-sensor cameras can be displayed simultaneously.

USB Cameras

With Up To 4 External Sensors



External sensor board OEM (1:1)



COB single-sensor camera with remote sensor

Multi-Sensor Cameras

USB multi-sensor cameras are equipped with 2, 3, or 4 pixel-synchronous sensors. The sensor boards are connected to a camera base unit with up to 100 cm long flex-foil cables and can be positioned freely. An FPGA chip in every multi-sensor camera provides for smooth processing of the image data.

Different camera base units and sensor types are available and can be combined. Sensors can be added or removed easily through the camera's plug and play functionality. Color and monochrome variants of the same sensor type can be used simultaneously on the same base unit.

USB multi-sensor cameras consist of one base unit VRmMFC and up to four remote sensor boards VRm(M)S-X.

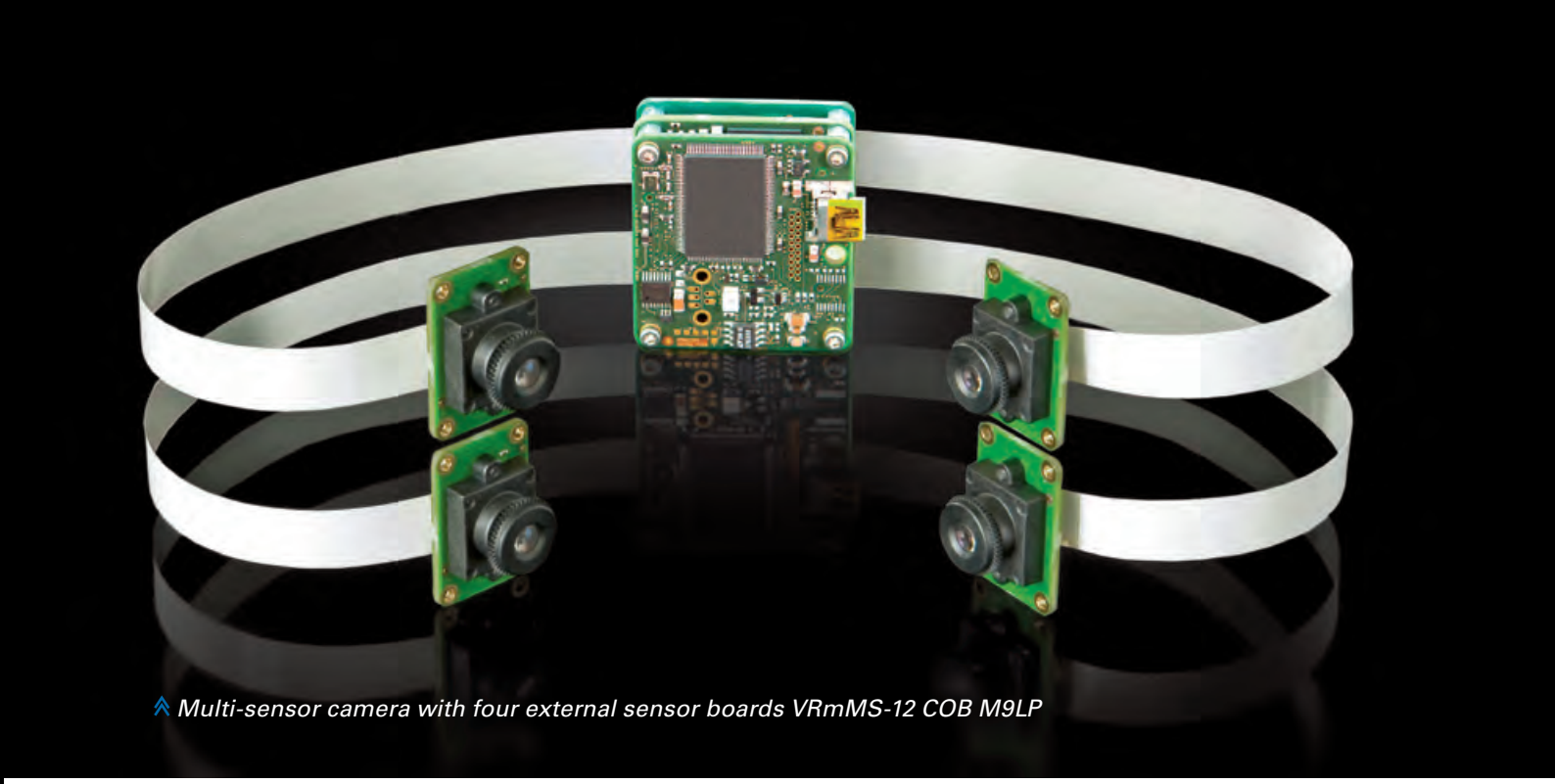
Single-Sensor Cameras with Remote Sensor

For applications with tight or angled installation space VRmagic offers cameras with a freely positionable external sensor board. The sensor board is connected to the camera base unit with an up to 100 cm long flex-foil cable with LVDS transmission.

USB single-sensor cameras with remote sensor consist of one base unit VRmC-X-E and one remote sensor board VRm(M)S-X.

Sensor Board Designs

- **OEM**: Sensor board without optics
- **COB**: Sensor board with lens mount (C-Mount, M9 Low Profile, M12), lens, and filter glass per sensor



Multi-sensor camera with four external sensor boards VRmMS-12 COB M9LP

Sensor Characteristics

Sensor Board	VRmS-8 *	VRmS-9	VRmS-12	VRmMS-12	VRmS-14
Sensor Manufacturer	Aptina	Aptina	Aptina	Aptina	Sony
Type	MT9T031	MT9M001	MT9V024	MT9V024	ICX445
Technology	CMOS	CMOS	CMOS	CMOS	CCD
Shutter	rolling	rolling	global	global	Interline Transfer
Color	●		●	●	●
Monochrome		●	●	●	●
Sensor Size	1/2“	1/2“	1/3“ wide	1/3“ wide	1/3“
Resolution	2056 x 1544	1288 x 1032	754 x 480	754 x 480	1296 x 966
Pixel Size [µm]	3.2 x 3.2	5.2 x 5.2	6 x 6	6 x 6	3.75 x 3.75
FPS (Full ROI)	13	30	69	69	22
Min. Exposure Time [µs]	60	38	30	30	15

Physical Characteristics

	VRmS-8 *	VRmS-9	VRmS-12	VRmMS-12	VRmS-14
Base Unit SIze [mm] **Multi-Sensor** **Remote Sensor**			 42 x 40 x 21 42 x 40 x 14		
Sensor Board Size [mm] **OEM**	42 x 38 x 7	42 x 38 x 7	42 x 38 x 7	28 x 19 x 7	42 x 38 x 9
Sensor Board Size [mm] **COB M9LP** **COB M12** **COB C-Mount**	 – 42 x 38 x 20 46 x 42 x 24	 – 42 x 38 x 20 46 x 42 x 24	 – 42 x 38 x 20 46 x 42 x 24	 28 x 19 x 11 28 x 19 x 17 –	 – 42 x 38 x 20 46 x 42 x 24
USB 2.0 Interface	Mini-B	Mini-B	Mini-B	Mini-B	Mini-B
Power Supply via USB possible	● single-sensor camera only	● single-sensor camera only	●	●	● single-sensor camera only
Connection for Trigger/ Strobe/Power	●	●	●	●	●

All dimensions W x H x D without lens and including connectors.
* The VRmS-8 sensor board can only be used with a remote sensor camera. Usage with multi-sensor cameras is not possible.

USB Single-Sensor Cameras

Single-sensor cameras are assembled as one compact unit. They are available with a wide range of different sensors from Aptina, CMOSIS, and Sony, with CCD or CMOS technology, in various resolutions and sizes.

Ultra-precise Sensor Positioning

All cameras in COB C-Mount or PRO design that are equipped with a Sony or a CMOSIS sensor are assembled using the ultra-precise sensor positioning system by VRmagic. The sensor is positioned and aligned with the highest possible accuracy before it is soldered to the board.

Compact Single-Board Cameras

USB cameras by VRmagic are also available as compact single-board cameras. All cameras in compact design are labeled with a + symbol in their product name, for example VRmC-12+.

Camera Designs

- **OEM**: board-level camera without optics
- **COB**: board-level camera with lens mount (C-Mount, M9 Low Profile, M12), lens, and filter glass per sensor
- **PRO**: Camera in anodized aluminium housing with C-Mount

OEM and PRO cameras in compact single-board design

PRO cameras with different sensors

From left to right: OEM board-level camera, COB M12 board-level camera, OEM board-level camera

Sensor Characteristics

	VRmC-8	VRmC-9	VRmC-12	VRmC-14	VRmC-16	VRmFC-22	VRmFC-42
Manufacturer	Aptina	Aptina	Aptina	Sony	Aptina	CMOSIS	CMOSIS
Type	MT9T031	MT9M001	MT9V024	ICX445	MT9M021	CMV2000	CMV4000
Technology	CMOS	CMOS	CMOS	CCD	CMOS	CMOS	CMOS
Shutter	rolling	rolling	global	interl. transfer	global	global	global
Ultra-precise Sensor Positioning	–	–	–	● PRO, COB C-Mount	–	● PRO, COB C-Mount	● PRO, COB C-Mount
Color	●	–	●	●	●	●	●
Monochrome	–	●	●	●	●	●	●
Sensor Size	1/2“	1/2“	1/3“ wide	1/3“	1/3“	2/3“ ultra wide	1“
Resolution	2056 x 1544	1288 x 1032	754 x 480	1296 x 966	1280 x 960	2048 x 1088	2048 x 2048
Pixel Size [µm]	3.2 x 3.2	5.2 x 5.2	6 x 6	3.75 x 3.75	3.75 x 3.75	5.5 x 5.5	5.5 x 5.5
FPS (Full ROI)	13	30	69	22	45	44	24
Min. Exposure Time [µs]	60	38	30	15	105	1,5	1,5

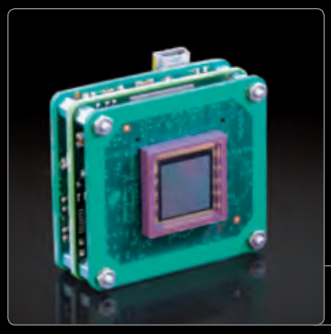
Physical Characteristics (Regular Design)

	VRmC-8	VRmC-9	VRmC-12	VRmC-14	VRmC-16	VRmFC-22	VRmFC-42
Size [mm]							
OEM		42 x 40 x 14		42 x 40 x 16	42 x 40 x 14	42 x 40 x 23	
COB M12		42 x 40 x 28		42 x 40 x 28	42 x 40 x 28	–	
COB C-Mount		46 x 42 x 32		46 x 42 x 32	46 x 42 x 32	46 x 42 x 39	
PRO		46 x 42 x 38		46 x 42 x 39	46 x 42 x 38	46 x 42 x 45	

Physical Characteristics (Compact Single-Board Design)

	VRmC-8+	VRmC-9+	VRmC-12+	–	–	–	–
Size [mm]							
OEM	32 x 35 x 7	32 x 35 x 7	32 x 35 x 7				
COB M9LP	–	–	32 x 35 x 9				
COB M12	32 x 35 x 18	32 x 35 x 18	32 x 35 x 15				
PRO	36 x 36 x 27	36 x 36 x 27	36 x 36 x 27				

All dimensions W x H x D without lens and including connectors.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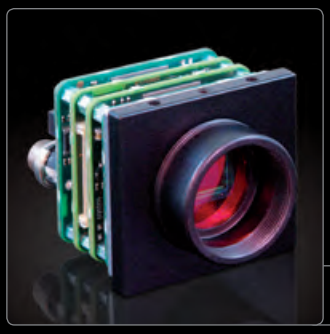
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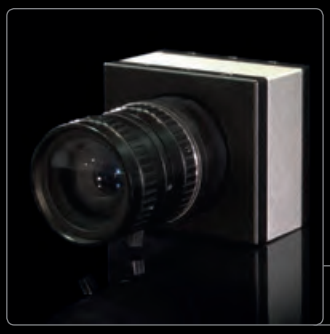
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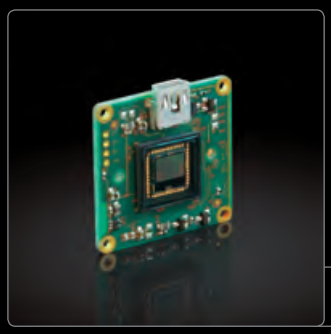
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Standard Designs

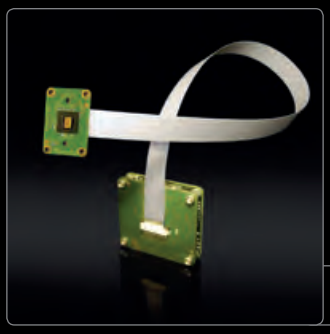
Design	Description
OEM	Board-level cameras and sensor boards without optics and without housing Board-level framegrabbers without housing
COB M9LP	Board-level cameras and sensor boards with M9 low profile lens mount and low profile lens (6.0 mm F2.8) with infrared filter vapor coating
COB M12	Board-level cameras and sensor boards with M12 lens mount (S-mount), lens (12.0 mm F2.0) and infrared filter (alternative filters and lenses available)
COB C-Mount	Board-level cameras and sensor boards with C-mount and infrared filter (alternative filters available, lens not included)
PRO	Cameras in aluminium housing with C-mount and infrared filter (alternative filters available) Framegrabbers in aluminium housing
IP PRO	Extremely robust intelligent single-sensor camera in aluminium housing with IP67 protection; M12 lens and filter glass already integrated

Available Components

	OEM	COB M9LP [1]	COB M12	COB C-Mount	PRO	IP PRO
Multi-sensor cameras	●	●	●	●		
Single-sensor cameras with remote sensor	●	●	●	●		
Single-sensor cameras	●		●	●	●	●
Compact single-board cameras (USB only)	●	●	●		●	
Framegrabbers	●				●	

1 The COB M9LP design only is available in combination with sensor 12 (Aptina MT9V024)

07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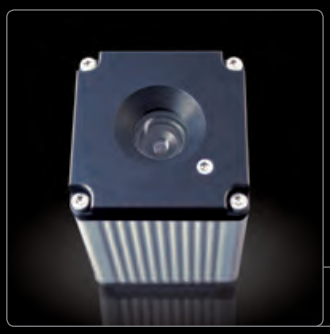
Available Designs


10

Custom Designs

When a complex application demands an exceptional approach, VRmagic can develop exactly the solution you require. A multitude of customer-specific designs has already been put into practice. Feel free to contact us.

Image Explanations

01 OEM
Single-sensor camera without optics

02 OEM
Compact single-board camera without optics

03 COB C-Mount
Single-sensor camera with C-mount

04 COB M12
Compact single-board camera with M12 lens mount and lens

05 PRO
Single-sensor camera in aluminium housing with C-mount

06 PRO
Compact single-board camera in aluminium housing with C-mount

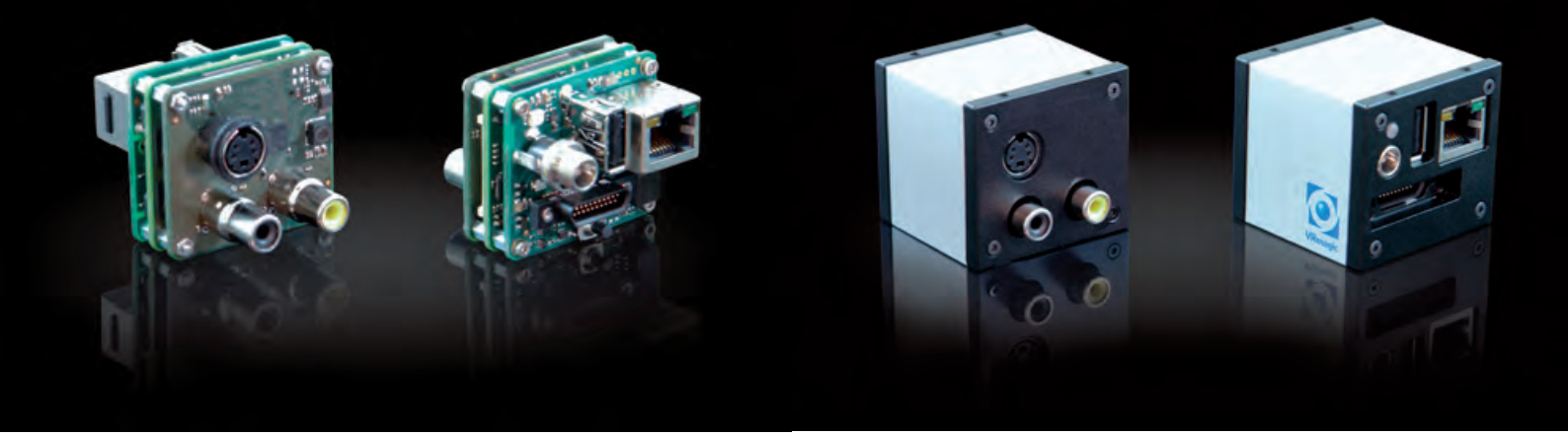
07 OEM
Multi-sensor camera without optics

08 OEM
Single-sensor camera with remote sensor, without optics

09 COB M9LP
External sensor board with M9 low profile lens mount and lens

10 IP PRO
Intelligent single-sensor camera with IP67 protection and integrated optics

Intelligent Framegrabbers



Turn any Analog Camera into an Intelligent Camera

In combination with analog cameras, the new intelligent framegrabber VRmDAVC-2 can perform image processing tasks fully autonomously. The direct connection of peripherals (for example monitor via HDMI or Wi-Fi via USB host) and control of equipment via RS232 or GPIOs opens up a wide range of applications. Processed images can be streamed via Ethernet.
The intelligent analog video converter features a 300 MHz ARM9 processor running Linux and a 600 MHz C64x+ DSP with 4800 MIPs, which is fully available for image processing tasks. A preconfigured toolchain with cross-compilers for Windows and Linux enables development of framegrabber software on the PC. Because all VRmagic imaging components feature the same API, the devices are interchangeable without the need to rewrite applications.
The intelligent analog video converter transforms every PAL/NTSC camera into

- a programmable, intelligent camera with Linux OS,
- an IP/Ethernet camera,
- a digital camera with DVI or HDMI output,
- a still camera or video camera unit with USB mass storage.

Interfaces

	VRmDAVC-2
Analog Video Inputs	Composite (1 cinch connector), Y/C (2 cinch connectors) S-Video (4-pin mini-DIN connector)
Analog Video Outputs	S-Video, Composite
Digital Video Outputs	DVI or HDMI output available on separate adapter board
Further Interfaces	100 Mbit Ethernet on RJ45 (supports streaming over Ethernet), USB 2.0 host, MPE-Garry Micro-T connector for RS232/S-Video/ Composite/GPIOs, Hirose DF14-15P connector for JTAG and serial console (OEM only), 5 V power supply

Analog Video Input

	VRmDAVC-2
Color Formats	YUV, gray
PAL Video Formats	720 x 576 (25 Hz, deinterlaced) 360 x 288 (25 Hz) 720 x 288 (50 Hz)
NTSC Video Formats	720 x 480 (30 Hz, deinterlaced) 360 x 240 (30 Hz) 720 x 240 (60 Hz)

Physical Characteristics

	VRmDAVC-2
Dimensions **OEM** [mm] (board version)	42 x 38 x 49
Dimensions **PRO** [mm] (in aluminium housing)	46 x 42 x 49
Framegrabber available with D3 platform	•

New D3!

USB Framegrabbers

The Easiest Way to Integrate Analog Cameras

The analog video converter transforms every PAL/NTSC camera into a USB camera, which can be connected to PCs and notebooks using the USB interface. The USB interface also serves as power supply for the converter. The image data is transferred to the PC and can be accessed conveniently using the VRmagic API. Because all imaging components from VRmagic feature the same API, no adjustments are necessary if the framegrabber is replaced by a different framegrabber model or a digital camera. This makes it possible to gradually switch from analog to digital devices.

- Connects any PAL or NTSC camera to a PC using the USB interface
- With time stamp and framecounter
- Up to nine user configurations (format, contrast, calibration data, ...) can be stored in the device
- SDK and API included
- Custom designs available

Interfaces

	VRmAVC-2
Analog Video Inputs	Composite (1 Cinch-Verbinder) Y/C (2 Cinch-Verbinder) S-Video (4-pin mini-DIN-Anschluss)
Video Output	USB Mini-B
Power Supply	USB Mini-B

Analog Video Input

	VRmAVC-2
Color Formats	YUV, gray
PAL Video Formats	720 x 576 (25 Hz, deinterlaced) 360 x 288 (25 Hz) 720 x 288 (50 Hz)
NTSC Video Formats	720 x 480 (30 Hz, deinterlaced) 360 x 240 (30 Hz) 720 x 240 (60 Hz)

Physical Characteristics

	VRmAVC-2
Dimensions **OEM** [mm] (board version)	42 x 38 x 33
Dimensions **PRO** [mm] (in aluminium housing)	55 x 45 x 33

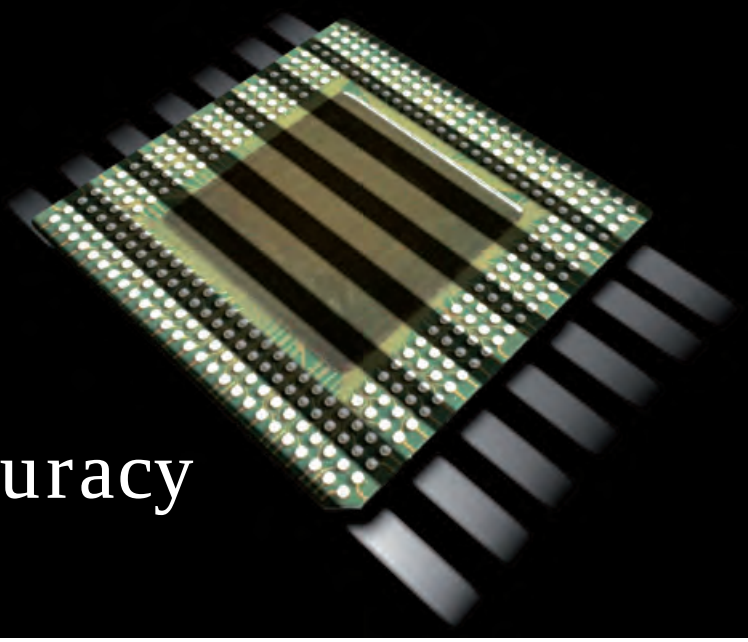
AreaScan3D

3D Area Sensor

AreaScan3D is a 3D area sensor based on digital fringe projection. The sensor supplies ready-calculated 3D data records for industrial image processing. The data is output directly as a 3D point cloud, gray-scale coded area map, or 2D image.

- Metric calibration
- Data output formats: 3D point cloud, gray-scale coded area map, or 2D image
- Addressed via GenICam™ transport layer (GenTL)
- Interfaces to Common Vision Blox and HALCON
- Aluminum housing with IP65 rating
- M12 connectors according to IEC 61076-2-101
- 24 V operation
- 100 Mbit Ethernet interface
- Hardware and software trigger
- OEM solutions available

AreaScan3D outputs data directly as a 2D image, gray-scale coded area map, or 3D point cloud.



Guaranteed
Measuring Accuracy

Robust, Accurate, and Fast 3D Data Acquisition!

AreaScan3D is based on the robust, accurate, and fast method of digital phase-measuring fringe projection. Fringe projection, image recording, and generation of the point cloud are performed in an integrated manner based on an intelligent camera from VRmagic. Acquisition and calculation of the 3D point cloud are performed directly within the sensor. The DLP Pico™ projector from Texas Instruments and the camera are synchronized with a frequency of 60 Hz. Measuring accuracy of AreaScan3D is guaranteed in the sub micrometer to millimeter range, depending on the measuring volume. The material color does not have any influence on measuring accuracy.

Suitable for Industrial Environments

The AreaScan3D sensor can be integrated in industrial installations via the Industrial Ethernet interface. The lightweight sensor features a robust metal housing with IP65 protection, screw-type standard industrial connectors, a 24 V connection, as well as hardware and software triggers.

Easy Integration

Integration of AreaScan3D with existing customer or standard software is easy through standardized interfaces to GenTL. A viewer demo based on GenTL including sources is available.

Technical Data

	AreaScan3D 01-018	AreaScan3D 01-120
Measuring Volume [mm]	18 x 13 x 5	120 x 75 x 50
Number of Measuring Points	748 x 480	748 x 480
Micro Mirrors	480 x 320	480 x 320
Point Density [µm]	24	160
Height Resolution [µm]	> 4	> 20
Working Distance [mm] (from lower case edge)	255 ± 1	285 ± 5
Min. Working Distance [mm]	252.5 ± 1	260 ± 5
Max. Working Distance [mm]	257.5 ± 1	310 ± 5
Min. Projection Time [s] (time the object has to stand still)	< 0.5	< 0.5
3D Data Calculation Period [s]	< 2	< 2
Housing Size [mm]	138 x 55 x 171	138 x 55 x 171
Weight [kg]	1	1
Interfaces 3 x M12 circular connectors	10/100 Mbit Ethernet on 4-pin connector, power supply and RS232 on 5-pin connector, trigger/ strobe on 8-pin connector	

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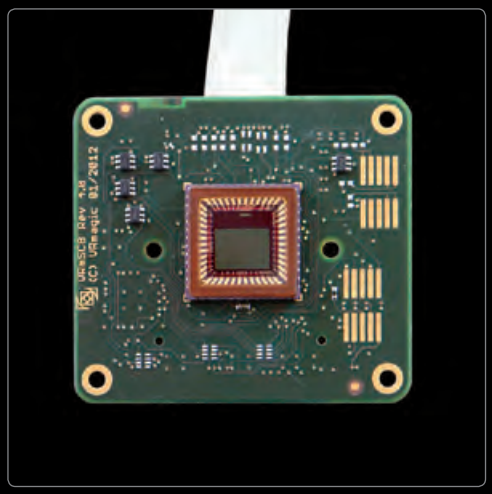

VRmagic cameras are compatible with:

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